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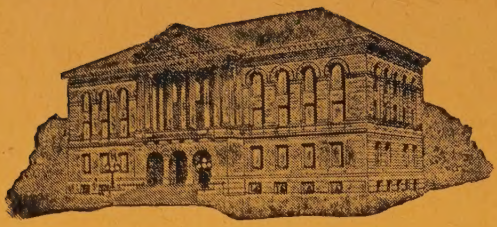

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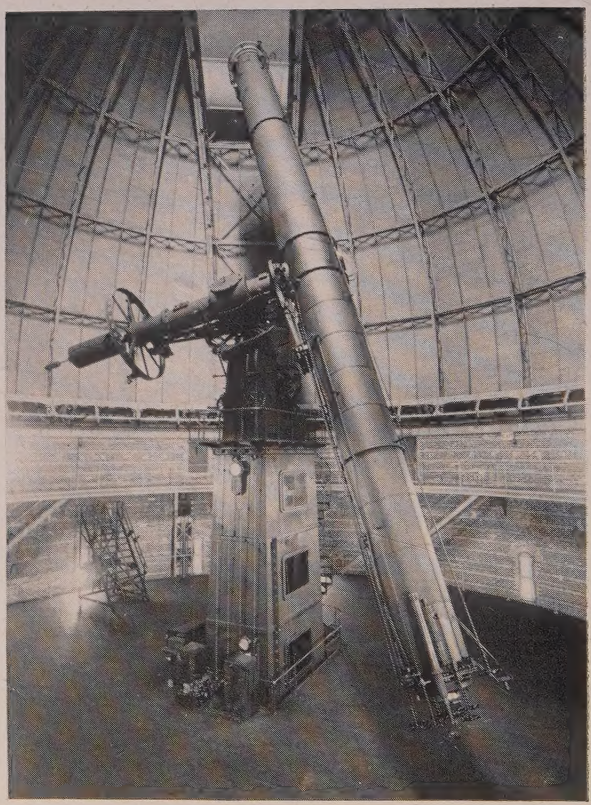


The 40-inch telescope of the Yerkes Observatory.

The Yerkes Observatory of the University of Chicago

Otto Struve*

Fifty years ago a small group of astronomers from the University of Chicago were impatiently awaiting the completion of the mounting for the greatest of all refracting telescopes at Williams Bay, Wisconsin, on the north shore of Lake Geneva. Five years earlier the Yerkes Observatory had been only a dream in the mind of an enthusiastic young scientist, Dr. George E. Hale. On Chicago's south side, at the corner of 46th Street and Drexel Boulevard, he had established a private research institution — the Kenwood Observatory — which had rapidly become the center of astrophysical study in the middle west. With the aid of his father, Mr. Hale had purchased a fine telescope of 12 inches in aperture and had engaged with it in the study of the sun. Since his boyhood days he had been interested in the use of prisms and lenses. He had read in a popular book how to construct a simple spectroscope by means of a narrow slit, a simple lens for collimation, a glass prism, and a small viewing telescope. With an instrument of his own construction he began to examine the light of the sun, and he was fascinated when he found that he could see not only the continuous spectrum with its brilliant colors of the rainbow, but also the hundreds of sharp, black lines, which had first been observed in 1802 by Wollaston in England, and which we call Fraunhofer lines, in recognition of the famous German optician who made the first systematic study of these lines and catalogued them.

Gradually, Hale was tempted to make more and more difficult observations. He attached his spectroscope to a telescope and began to observe the edge of the sun with its tornado-like outbursts of hot, luminous hydrogen gas. When the image of the sun was kept off the slit, with the edge nearly tangential to the latter, Hale could sometimes see on a dark background a bright red dot in the position normally occupied by the hydrogen line alpha. If he shifted the telescope by a small amount, so that the edge of the sun would be moved farther away from the slit, the dot would often change in appearance and in brightness because the slit would then be illuminated by a different portion of the eruption. Hale began to wonder whether he could not secure a composite picture of the entire eruption by first substituting a photographic plate for the eye of the observer and by next furnishing his equipment with two motions: the telescope was slowly moved in a given direction so that the image of the sun

*Honorary Director, Yerkes and McDonald Observatories, and chairman of the Department of Astronomy and Astrophysics, University of Chicago.

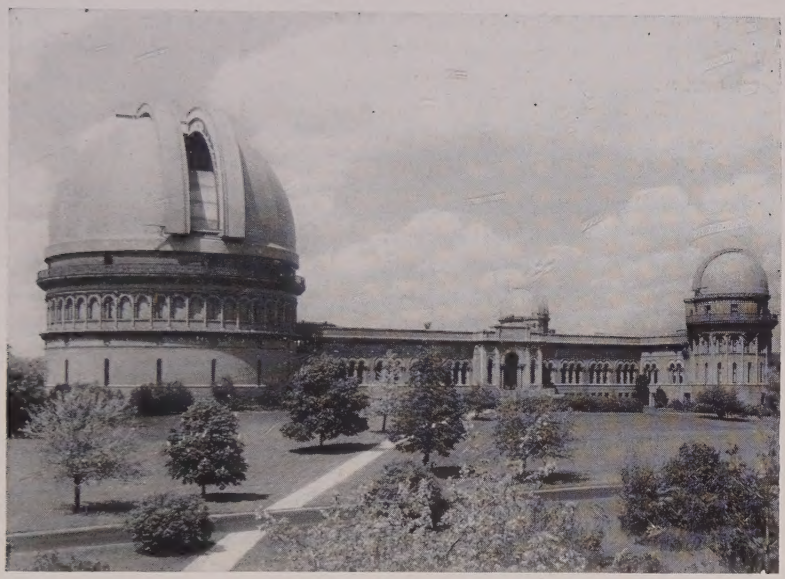
drifted from its original position near the slit to a position farther removed from it. At the same time an electric motor was used to slowly shift the photographic plateholder in his viewing telescope. As different portions of the invisible eruption drifted across the slit of the spectroscope they recorded their individual little bright dots in a continuous manner upon different parts of the photographic emulsion. When the plate was developed it showed a complete picture of the entire eruption.

The arrangement used by Hale was named by him the "spectroheliograph." Its invention ranks among the greatest advances in astronomy since the invention of the telescope. It was so simple that other astronomers found it difficult to understand how they could have missed it. Yet, for some fifty years, they had been making observations of solar eruptions laboriously recording their structure dot by dot, as they were shifting the telescope by hand.

At the Kenwood Observatory Hale continued his observations and made many important improvements in his new instrument. But he found that the structure of the solar eruptions and other surface markings was so intricate and so fine that the resolving power of his 12-inch telescope was not sufficient. He determined that he needed a much larger telescope.

In 1892 he accepted an appointment as associate professor at the new University of Chicago; but President Harper was struggling with great financial difficulties — enhanced by one of our periodic economic depressions — and he was not able to furnish the necessary funds for the construction of a large observatory. During the summer of the same year Mr. Hale attended a scientific meeting at Rochester, New York. By a fortunate accident he overheard a conversation between the famous optician, Alvan G. Clark, and several other members of the Association. It seemed that in 1889, when the Lick Observatory was beginning to create its worldwide reputation, the people of southern California, then in the uproar of a land boom, had decided to follow the example of James Lick and had placed an order in France for two forty-inch glass discs. In the meantime the land bubble had burst and the two finished discs were for sale to anyone who wanted to pay $16,000. This was a wonderful opportunity for someone to get the discs without delay. Mr. Hale hurried home and soon succeeded in convincing Charles T. Yerkes — builder of Chicago's surface lines, of the London Underground Railways, and astute promoter of many successful business ventures — to place a contract for the grinding and polishing of the discs with Alvan Clark.

The lens was finished in 1895 and was found to be of remarkably fine quality. In the meantime the mounting had been constructed by the Warner and Swasey Company in Cleveland and had been exhibited at the Columbian Exposition in Chicago in 1893. The building was finished



The Yerkes Observatory of the University of Chicago, Williams Bay, Wisconsin.

early in 1897 and on May 21 the first astronomical observations were made by Mr. Hale and his famous associates, Professors E. E. Barnard and S. W. Burnham. All three agreed that no man had ever before seen the stars so clearly and with so fine a definition. Mr. Barnard even discovered a new optical companion to the brilliant summer star Vega.

The observatory was officially dedicated on October 21, 1897, in the presence of Mr. Yerkes, President Harper of the University of Chicago, and a large gathering of faculty members and visiting astronomers.

Since then the 40-inch telescope has been used for observing the heavens on all clear nights and on many clear days. More than a hundred thousand photographs have been obtained with it, and millions of visual observations and measurements. It is still the largest *refracting* telescope in the world. A 50-inch objective, made in France many years ago, was found to be useless for scientific work and has never been mounted. A 41-inch lens was ordered for a Russian observatory before World War I. It was never finished. There are, of course, in existence several *reflecting* telescopes which exceed the 40-inch in aperture and, therefore, in light-gathering power. The Yerkes astronomers now make use of an 82-inch reflector at the McDonald Observatory. It is exceeded only by the Mount Wilson 100-inch telescope. Within a year or so it will drop to third place when the Mount Palomar 200-inch mirror is completed.

But the Yerkes 40-inch remains supreme in certain types of astronomical research, where permanence of shape and of optical properties is of importance. For example, the determination of accurate star distances by a method involving the measurement of relative separations of stars on a photographic plate can be carried out better with the 40-inch than with any other instrument now in existence.

Professor Hale remained at the Yerkes Observatory until 1904, when he became the first director of the new Mount Wilson Observatory at Pasadena, California. He was succeeded by Professor Edwin B. Frost, a noted spectroscopist who had, until 1898, been in charge of the Shattuck Observatory of Dartmouth College. As a member of the staff of the Yerkes Observatory he had carried out several important investigations of the spectra of the "helium-stars." The element helium had only a short time before been discovered on the earth, and there was much speculation about the nature of the stars which prominently show the lines of helium in their spectra.

The later years of Mr. Frost's administration were clouded by his blindness. He lost the sight of one eye in 1915 while he was working with the 40-inch telescope. But, strangely, it was not the strain of observing a star which caused the process that led to a loosening of the retina, but the rather simple task of reading one of the large divided circles which astronomers use in order to set the telescope in the desired position. In 1921 a rapidly growing cataract ended his vision completely. The tragedy of an astronomer's blindness cannot be adequately described. History knows of only one other similar case — that of the great Italian astronomer Galileo who also became blind.

Professor Frost retired from the directorship in 1932 and was succeeded by the writer of this article. Although the 40-inch telescope was still being used in important research in astronomy, there were many problems in the newer branch of astrophysics which required the greatest possible light-gathering power. Through the initiative of President Robert M. Hutchins of the University of Chicago an agreement was concluded with the University of Texas for the joint operation of a new observatory in western Texas. A fine 82-inch telescope of the reflecting type was built by the Warner and Swasey Company of Cleveland, from the W. J. McDonald bequest to the University of Texas. The telescope was finished in 1939 and it has since then been used for many astrophysical investigations.

The past few years have witnessed an astonishing increase in the scope of astronomical study. On the one side there are technical developments — many of them the results of war research — such as the photography of the spectrum of the sun in the extreme ultra-violet region from V-2 rockets which carry within their warheads specially constructed spectro-

graphs; or such as the use of radio-wave technique to record the phenomenon of "cosmic static" which originates in the sun and in interstellar space. On the other side there are theoretical researches into the problems of energy generation in stars from nuclear processes. The Yerkes staff is taking an active part in these new developments and has, in consequence, greatly increased in size and complexity. On July 1, 1947, a complete reorganization of the observatory was put into effect by the University of Chicago, at the recommendation of the present writer. Dr. G. P. Kuiper has started as the fourth director of the Yerkes Observatory and the second director of the McDonald Observatory, replacing the writer, who has become honorary director of both observatories and chairman of the department of astronomy and astrophysics of the University of Chicago. Dr. S. Chandrasekhar has been made the head of a section of theoretical astrophysics at the Yerkes Observatory, and Dr. W. W. Morgan was designated as the managing editor of the *Astrophysical Journal.* The teaching section on the campus in Chicago is to be revived. The department will thus consist of four sections: the two observatories, the theoretical section, the *Astrophysical Journal,* and the Chicago branch.

During the fifty years of its existence the Yerkes Observatory has produced results of great and lasting importance to science. Professor E. E. Barnard started photographing the Milky Way with wide-angle lenses, and obtained the best records in existence of the structural details of our galaxy, of the nebulae and star clusters. The best of these photographs, some with exposure times of five hours, or more, were published by the Carnegie Institution of Washington in the form of an "Atlas of Selected Regions of the Milky Way." This work was continued by Dr. F. E. Ross who noticed that the older types of wide-angle lenses gave badly distorted star images near the edges. He had made a thorough study of the design of optical instruments and invented a new type of photographic objective which is internationally known as the "Ross-lens." With it he produced a second "Atlas of the Milky Way" published by the University of Chicago Press.

The most productive period of research was that spent by Professor F. Schlesinger (the father of the present director of the Adler Planetarium) at Yerkes. In the course of less than two years he invented a new photographic method of determining the distances of the stars, which not only increased the precision of such measurements by a factor of ten, but also gave a ten-fold gain in efficiency. His method has since been adopted by all large observatories. It is still in use at Williams Bay.

A spectacular result was the first measurement of the heat radiation of the stars by Professor Nichols, in 1899. He used a small radiometer, which is now on exhibit at the Adler Planetarium. Another result which started the scientific world buzzing was the measurement by Professor A.

A. Michelson of Chicago of the tides of the solid earth. On the grounds of the Yerkes Observatory two long water-filled pipes were installed and a sensitive interferometer was used to measure the level of the water at the two ends, located north-south and east-west. The records indicated how much the crust of the earth is pulled out of shape by the gravitation of the moon and of the sun. The theoretical interpretation of Michelson's observations was made by Professor F. R. Moulton of the astronomy department of the University of Chicago.

More recently, Dr. S. Chandrasekhar — a native of Madras, India, and now a distinguished service professor of astrophysics at the University of Chicago — has achieved fame through his work on the origin of the chemical elements in the universe and through his mathematical study of the physical properties of the stars. Dr. G. P. Kuiper has built and used a new spectrometer which measures the heat radiation of the planets and stars. In collaboration with Dr. G. Herzberg, he has accurately determined the amount of carbon dioxide in the atmosphere of Venus, and that of methane and ammonia in Jupiter's atmosphere, and in that of Jupiter's largest satellite, Titan.

Stellar spectra have been photographed at Yerkes and McDonald since the beginnings of these two observatories, and many astonishing results have been obtained. An atlas of stellar spectra by Morgan, Keenan and Kellman has become the international standard for the classification of the stars.

During the recent war the staff was mostly engaged in research work for the government. An optical shop and a theoretical bureau for the design of optical instruments for the army and navy operated under a contract with the U. S. Office of Scientific Research and Development. Under Drs. L. G. Henyey and J. L. Greenstein the bureau designed special photographic cameras having an angle of more than 100°, not to speak of numerous less startling systems. Some of these optical devices will be of value in future astronomical uses.

An important function of the Yerkes Observatory has been the training of young astronomers. Graduate students from the University of Chicago work at Williams Bay for their doctors' degrees. Among the Observatory's graduates are many scientists of international reputation: Dr. Edwin Hubble and Dr. Edison Pettit of Mount Wilson Observatory, Dr. N. T. Bobrovnikoff, director of the Perkins Observatory, Dr. J. A. Hynek, director of the McMillin Observatory of Ohio State University, and Dr. G. Münch, of the University of Mexico's National Observatory at Tacubaya, are a few of them. In addition, a great many scientists from this country and abroad have spent some time at Williams Bay taking part in the research work of the staff. At the present time the observatory group includes natives of Canada, Belgium, Holland, Denmark, Russia, Germany, China, and India.

Although the observatory is located in Wisconsin, ninety miles northwest of Chicago, it is in a very real sense one of the cultural assets of the people of Chicago. Its location was chosen by the most competent scientists, including Professor S. W. Burnham, who worked during weekdays as a successful court reporter in Chicago and spent the nights of his weekends observing double stars with the 40-inch telescope. The observatory staff consists of employees of the University of Chicago. The observatory is open to visitors on Saturday afternoons during the summer, and on Saturday forenoons during the winter. Because nearly all astronomical work is now carried out by photography or with special electronic devices, it is not possible to admit the public to the dome at night. But during the regular visiting hours the great telescope is open for inspection, and a member of the scientific staff demonstrates the operation of the instrument.

The observatory is urgently in need of financial support, and it is looking to the people of Chicago for help in carrying out its scientific program. Mr. Yerkes' original gift provided the equipment, but did not include endowment for the staff. Chicago now has many capable astronomical research workers. A few years ago a famous English scientist, the late Sir Arthur Eddington, expressed the opinion that the Chicago astronomical organization was the best in the world. To retain this standing the observatory addresses itself to all public minded citizens of Chicago: help us by means of gifts for special fellowships and professorships and by means of donations for the construction of modern equipment not now available!

When he's taking his nap in the dead of winter,
His house, without mercy, you hammer and splinter,
And the grub in the willow, Oh, Downy Woodpecker,
Regards you, no doubt, as a spoiler and wrecker.
But we, who afar hear your rub-a-dub-dub,
Say, "Just a poor woodpecker, earning his grub!"

Edward R. Ford

Reprinted from *The Audubon Bulletin*, No. 57, March, 1946, page 14.

Some Roadside Flowers of Central America

Margery C. Carlson*

Travelers to Mexico and the Central American countries are usually fascinated by the profusion, the variety and brilliance of the flowers along the roadsides. I have heard many of them remark, "I wish I knew what these flowers are." Because I, too, was fascinated by them, I studied and photographed them during a three-months' visit to Guatemala and El Salvador in early 1946. I made the journey, with an assistant, Kate Staley, primarily to collect native plants for the herbarium of the Chicago Natural History Museum. We obtained some 4000 specimens, 1000 species, which are now placed in the herbarium to be used in the studies of Central American plants being conducted by Dr. Paul C. Standley and Dr. Julian Steyermark. These investigators have been studying the plants of Mexico, Central and South America for many years and have already published part of their "Flora of Guatemala."

Native plants can usually be found along the roadsides, even in densely populated and much cultivated parts of a country. Roads are much the same the world over. They may pass along river valleys, large or small, with slopes high or low, steep or gentle, or they may pass along cuts made in the sides of hills or mountains, or through open country between fields (Fig. 1). The first roads, no doubt, were only paths made by people walking in single file. They widened when the people walked abreast or drove their oxen or horses along the paths. The wild plants which grew along the way were probably not much disturbed. Not until modern man brought in his bulldozers, which tear great swaths through the countryside for road building, and mowing machines which take their toll in the name of "weed" control, have the roadside grasses and flowering plants suffered. In primitive countries native plants still run riot beside the roads.

Those plants which can survive the difficult conditions of roadsides—dryness, poor soil and hot sun—are the pioneers of the plant kingdom, the hardy species. They are usually widely distributed species and are often contemptuously called weeds. Many of these weeds of Central America are species which are carefully tended as garden flowers in this country. Here we do not call them weeds.

What is a weed? Is it not a plant growing where it is not wanted by someone? It might be planted in a garden by someone else. The derogatory connotation of the word, weed, has come from the difficulty of exterminating such plants from the places where they are not wanted. It does not

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Fig. 1. "Roads are much the same the world over. . . . . "

lessen their beauty. If the plants of the roadsides do no harm, and, in fact, add beauty to the landscape, why should we call them weeds?

The most abundant and representative roadside herbs of Central America belong to the large families Compositae, Melastomaceae and Scrophulariaceae.

We collected 62 species of Compositae in El Salvador, 24 of which had not been previously reported for that country. Probably the largest genus of plants, and certainly the largest genus of the Compositae, is *Senecio*. The senecios may be herbs, scandent shrubs, or vines which scramble over other plants and make handsome displays of their great masses of yellow or orange heads of flowers (Fig. 2). Nineteen species are listed for Costa Rica, four for El Salvador. We found five additional species in El Salvador.

Eupatorium is also a large genus of common roadside herbs, shrubs and even trees. We collected 12 species in many locations at all elevations between 2000 and 8000 feet. The commonest were *E. leucocephalum* Benth. and *E. pycnocephalum* Less. Some species are similar to *Ageratum* which is also common in Central America. Both genera are frequently used in gardens here, *Ageratum* as an annual and *Eupatorium* as a perennial. Both are called "mejorana" in El Salvador.

Another wide-spread genus of the Compositae is *Bidens*, whose masses of yellow heads brighten our roadsides in mid-summer. *Bidens* species are called stick-tights because the two-pronged fruits cling to clothing and the coats of

animals. In Central America they are called "mozotillo," little man, because the fruit is shaped like the figure of a man. *B. pilosa* L. (Fig. 3) is usually less than three feet tall and has white flowers. *B. squarrosa* H.B.K. is a vine with bright yellow heads. *Cosmos,* which is similar to *Bidens,* is also common. *Cosmos* is a great favorite in northern gardens.

During a first visit to Central America, one is surprised to find the garden marigolds growing wild in fields and along the roadsides. Garden marigolds probably originated from the widespread Mexican species, *Tagetes erecta* L. Of course, they have been greatly improved by selection and breeding. The Spanish call them "flor de muerto," flower of death.

Fig. 2. *Senecio,* a composite. *Castilleja communis,* Indian paint brush.

Fig. 3. *Bidens pilosa* L. *Cuphea* sp? *Calceolaria* sp?

The Melastomaceae constitute another large family of tropical American plants which are characterized by conspicuous ridges extending from the base to the tip of the leaves and sometimes also crosswise between the ridges. We collected several genera of herbs—*Centradenia, Heterocentron, Tibouchina* and *Schwackaea*—in the central, populated parts of El Salvador and five species of *Miconia* and one of *Conostegia,* which are shrubs, in the cut-over and formerly cultivated areas. *Conostegia xalapensis* (Bonpl.) D. Don, called "citín," is a beautiful shrub with large pyramidal clusters of dusty pink buds and flowers and with stems and backs of leaves covered with a rusty tomentum (Fig. 4).

Cuphea sp? (Fig. 3), a member of the loosestrife family (Lythraceae) is a small plant whose interesting flowers bear two bright red petals which stand

out like the ears of a field mouse. The species in the photograph was collected in Guatemala. We found other species with lavender flowers in El Salvador.

The third plant in Figure 3 is *Calceolaria* sp?, one of the Scrophulariaceae. Its flower has a small yellow inflated sac. The showy calceolarias grown in northern greenhouses have been bred from natives of South America. The hybrids have large spotted sacs in a variety of colors. Another species of the Scrophulariaceae is *Castilleja communis* Benth. which appears with the *Senecio* in Figure 2. It will be recognized by most people because of its similarity to

Fig. 4. *Conostegia xalapensis,* "cirin," a beautiful shrub.

Fig. 5. *Yucca elephantipes,* "isote," a plant of many uses.

the familiar Indian paint brushes of this country, whose red or orange-tipped floral leaves or bracts are more showy than the flowers which they enclose. We found eight additional genera of this family.

Browallia americana L., one of the Solanaceae, is an annual with solitary bright blue flowers. Other species have violet or purple flowers. They are grown in gardens in the United States and Europe. In El Salvador they are called "simpatica," sympathetic, or "no-me-olvides," forget-me-not. They are not, however, the same as our forget-me-nots, which are in the family Boraginaceae.

To anyone who knows the milkweeds, *Asclepias curassavica* L., which resembles our butterfly weed *(A. tuberosa* L.), will be readily recognized. It grows along the roadsides, in hedges and in pastures, especially where the soil is

somewhat moist. It is found in Mexico and throughout tropical America. It is known as "señorita." Its milky juice is used there, as here, to destroy warts, probably with equal success. All the other species have dirty white or greenish flowers.

The Labiatae are represented principally by the genera *Hyptis* and *Salvia,* each with a large number of species. We were surprised to find so many shrubs among them. They have showy white, blue, red or purple flowers. We found one species, with large purple flowers, on the Volcano of San Salvador and in the mountains of the Honduran boundary of El Salvador, which has proved to be a new species. Several salvias are used in our gardens—*S. splendens,* the vivid red-flowered one which blooms in the fall, *S. azurea,* a low-growing blue one, and *S. argentea,* the silver salvia, which has wooly leaves.

Lantana Camara L., called "cinco nigritos," five little negroes, is abundant and conspicuous everywhere along the way. It gets its name from the shiny black fruits. This tropical species is a shrub with yellow or orange flowers, but forms of it in various colors are much used as bedding plants in gardens or as ornamentals in greenhouses.

"Isote," *Yucca elephantipes* Regel (Fig. 5), is found in hedges, in dooryards, and on coffee plantations where it is planted along terraces to keep the soil from washing. Its leaves are split and used as twine or to make a textile, both of which are common articles in the markets. Its flower buds are used in salads or are rolled in an egg batter and fried. It is a native of Mexico, but was probably introduced into Central America long before the Spanish conquest.

Black-eyed Susan

The black-eyed susan doesn't care
To grow in a garden bed.
She'd rather ramble through the wood
Or by the road instead.
Her leaves are coarse—
Her colors crude—
Yet she is more than vain.
I think that in her family
There is a gypsy strain.

L. Young Correthers.

(From "These Blooming Friends," obtainable from the author, Box 6, San Ysidro, Calif.)

Chastine Revisited

Karl P. Schmidt*

Some few of my colleagues have had occasion to write to me to ask where "Chastine, Louisiana," which they found on no map, might be. In the period from February to June, 1915, I had collected amphibians and reptiles for Cornell University, with a good sprinkling of other zoological specimens, while stationed as a kind of junior geologist at a wildcat oil well in northwestern Louisiana. My instructions had been to be meticulously accurate about locality labels. Our drilling was going on at the site of an old railway siding, long defunct in 1915, but still known as "Chastine" to local country people. Thus my specimens were correctly labeled Chastine. This locality was two miles north of the town of Creston. I made a plane-table map of the region, and as it became more

Chastine, Louisiana, 1915.

and more familiar to me, I became less and less aware that accuracy of designation of a locality implied also that other persons besides myself should be able to locate it on some published map. Indeed I had had a preliminary lesson in geography when I learned that the counties of Louisiana are known as "Parishes" and that Natchitoches Parish, to which I was being sent, is identifiable in Louisiana only if pronounced "Nackitosh."

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*Chief Curator of Zoölogy, Chicago Natural History Museum.

The confusion produced by using an unfindable locality on my specimen labels was to have been anticipated and avoided by a careful description and location of "Chastine" in the introduction to my paper on the amphibians and reptiles of the area. This was written during the following year at Cornell as a kind of undergraduate thesis. My introduction, on reëxamination, seems a quite adequate attempt to set forth the geographic and ecological setting in which my collections and observations were made. Professor Wright and I sent off my paper to the late Dr. Stejneger for advice as to publication, but it came back with a non-committal lack of recommendation, and the idea of publication was dropped. Many hundreds of papers on amphibians and reptiles have since then passed through my editorial hands, and I am of the opinion that my 1916 paper had modest merits of originality and a fair number of novel observations. Our departmental secretary in the American Museum, Miss Arlene Field, had the manuscript bound for me, and as one or another colleague has examined it, I have had the pleasure of having it quoted as "Schmidt, MS," with some pride in the very obscurity of the reference.

The four months at Chastine were, in fact, my childhood in the field of herpetology, and finding myself now about to be regarded as one of the elder bisons of the science, a nostalgic interest in the scenes of the beginnings of my career is inevitable. Why should I have taken that turn in 1915, momentous for me, that led to a career as student of amphibians and reptiles in field and laboratory, to the formation of one of the great museum collections of these animals, and to a museum curatorship? The layman, as non-scientist, may ask "Why herpetology?" and there is in fact no ready answer. Perhaps the best reply is that the pursuit of knowledge about our more lowly relatives is a part of the vast structure of pure science, and that this is as fundamental an expression of the human spirit as is music, or any other of the arts, and that it requires as little apology. So fundamental indeed is the urge for scientific research that some men would starve for the privilege of worshipping at the shrine of science, as many have, indeed, foregone other honors and successes to do. As for me, I rejected the offer of my good friend "Mister Bob," the driller at Chastine, to teach me the oil driller's trade. What a turn of the road that would have been, into the robust and exciting world of the oil fields! For that decision I have no regret, for pure science has taken me to the ends of the earth, made fast friends for me in other continents and on my own, and combined for me the excitement of a life of scholarship with the romance of exploration in exotic scenes.

At Chastine, my only stated duties were to wash the cuttings from the circulating mud of the rotary drill every evening, collect the fossils and thus establish the geological sections as if by examination of a core. It was no fault of mine that no fossils came up — we drilled through two

thousand feet of blue Eocene clay for days at a time with a two foot gypsum lens, and in the whole four months the mud brought up only a single fragment of oyster shell. With no fossils to box and label and send off to Professor Harris (under whose direction I worked), I took over the paper work of the camp, greatly to the relief of Mr. Bob, and even with some letter writing for the men, four hours a day was ample to accomplish everything. I was left with a treasure of true leisure on my hands. I used it to acquaint myself with the animal and plant life of the area, to collect zoölogical specimens for Cornell University, to write to my guide and counsellor and friend, Mrs. A. B. Comstock, and, I must add, to invite my soul in field and forest.

The setting at Chastine had extraordinary advantages for the elementary zoölogical activity of the collector of specimens. Logging operations at the turn of the century had taken out only the cream of the oak timber from the bottom land, but this had been good enough to warrant the Chastine siding and a network of railroad tracks through the forest. From this the rails had been salvaged. The ties of the temporary railroad were left to rot and supply ideal cover for those animals — the "cryptozoa" — that live beneath logs and stones in preferred seclusion. My principal collecting tools were simply hands and forceps (scorpions and centipedes and black widows seemed to make the forceps essential), and a canthook. An even more extensive habitat-cover was provided for my under-log fauna by the timber use that followed the logging era. This was tie-cutting, and in the period before 1915 much fine oak had been ruthlessly hewn into railroad ties. The process left as a waste product slabs some two feet long, often a foot wide, and two or three inches thick, round on the bark side (which was usually down) and flat on the other. The time since the tie-cutting era had been just sufficient to embed the slabs in the leaf mold and to rot the bark. These slabs were easy to turn by hand, and I must have turned over many thousands of them. It is extraordinary that they should not have been gathered up for fuel for the thin pine on the ridges above the bottom was being cut for much less desirable fire wood. On the ridges the remains of the pine logs and bark provided me with still more places in which to search for my herpetological prey and especially for lizards. How vividly I remember my first acquaintance with the abundant bombardier beetles, with their acrid explosive gas defense; the winter cell of a large and beautifully colored but incredibly stinking *Calosoma* under a tie; the odor of oil of bitter almonds from the large flat millipedes (some of which from my collection turned out to be new species, some even new genera); the gray webs at the bases of trees of the purse-web spider, and the black widows with their red hourglass mark under their abdomens; first encounters with the tarantulas that did not hesitate to attack even so formidable an enemy as myself; and my first scorpions and my first sting

from a scorpion. Some of these creatures I have continued to collect with success during my subsequent museum career, sometimes in remote corners of the earth.

The whole fauna of lizards and snakes and turtles, salamanders and frogs and toads was new to me and exciting as might be to any would-be zoölogist. I collected my first poisonous snakes, water moccasins from the Chastine Branch and a copperhead abroad on the dead leaf background for which its rich colors make so remarkable a match. I collected a new water snake, of a subspecies then quite unknown, and described its curious color pattern meticulously in my notes. I caught blue racers of a curiously distinct yellow-spotted type long before described and named by Cope under the erroneous impression that it came from Siam, and only now fully recognized as a well distinguishable subspecies — all these and salamanders and frogs and turtles strange and novel to me were listed, and my observations recorded, in my manuscript.

The birds and mammals of Chastine were scarcely less stimulating to the inception of my career as a naturalist than the cold-bloods I somehow already regarded as my special interest and concern. The monotonous peeping of the tufted titmouse was the most characteristic of the winter bird sounds; the abundant red-bellied woodpecker was known to me from a far-straying individual that had wintered over at our bird-shelf in Wisconsin; the hunting of the pileated woodpecker by the local residents as the woodcock, since an open season for woodcock was plainly set forth on their hunting licenses, astonished me. I was much more dismayed by the frank hunting of songbirds by small boys with BB-guns or 22-rifles, which being presented to their mothers, were cooked for them with no other thought than that they were delectable morsels of food merited by the diligent hunters. At Chastine I first encountered turkey buzzards actually engaged in their scavenging and saw them gather in numbers to watch an injured animal die.

Mammals new to my Wisconsin and New York experience were less obtrusive than the birds but equally exciting to a budding naturalist. When a nocturnal hunt for opossum and raccoon with the oil well workers obtained four opossums, these seemed so remarkable to me that I boxed them up alive and expressed them to my family in Wisconsin, so that my sister and two brothers could share so stimulating an acquaintance with an exotic animal. A marsh rabbit making its escape into a cattail swamp was my first knowledge that there might be a semi-aquatic rabbit. The common mole provided, just beneath the leaf mold, an endless network of tunnels that was exposed by my tie and slab turning. These slabs also provided an ideal habitat for the spotted and marbled salamanders and for a variety of snakes. As remarkable to me as any native mammals were the droves of feral pigs — the "razor-back hog" — whose powerful snouts,

thin bodies and long legs contrasted so sharply with Illinois hogs that I could appreciate the point of the well known directions for telling when a razor-back is fat by suspending it from its ears. If the body overbalances the snout, the hog is ready to butcher.

At nearby Black Lake I could wade among cypress knees and admire the feathery foliage of this magnificent tree. There I saw my first *Gambusia*, the little black top minnow since famous as a destroyer of mosquito larvae, whose production of living young in various stages of development within the mother at the same time has posed fundamental biological problems. Question and solution were equally unknown in 1915.

In the spring of 1947, thirty-two years after my spring at Chastine, my son and I and my herpetological brother, C. C. Liu (another student in whom the field naturalist virus implanted by James G. Needham and A. H. Wright "took") were driving home from the annual field meet of the Texas Herpetological Society. I had an appointment to meet at the University of Chicago, but we had a day to spare and had the happy thought to drive home via Chastine. Now it was not only the Chastine siding that was defunct — the Louisiana and Northwest Railway itself was gone, replaced by a new highway. Our post office of 1915, Creston, was still on the map, but quite unrecognizably changed by the growth of Black Lake as a fishing resort. As we drove north along the highway toward Chestnut, an opening in the forest appeared, and there was the clearing made for the Chastine well, the well itself capped with concrete and with gas bubbling from its water-filled opening. Our work at the well had so effectively eroded a part of the clearing and given foothold to grass in the rest that the forest had made little encroachment upon it. The pine board shacks in which we had lived had been removed to the last vestige. A six-inch drill bit, perhaps the last one used when the 2000 foot level was reached, lay at the side of the well.

We camped for the night and I had time under the starlight to remember and review the ways in which the golden gift of four months leisure at Chastine had affected and moulded my life. At Chastine I captured my first "hoop snake," there known as the "stingin' snake" and was confirmed in an interest in the folklore of snakes. At Chastine I first practiced the fruitful method of night hunting and night observations of frogs and toads as they engage in their loud spring chorus, species by species in seasonal succession. When my flashlight batteries were dead I used a "fat-pine" torch, and it was with such a flickering light, while standing knee deep in a borrow-pit along the railroad right of way that a water moccasin had writhed up between my knees, its head and tail pinned down by my respective feet. In that same borrow-pit I had seen, perhaps as the first human witness, the weaving courtship dance of the eel-like

salamander *Amphiuma,* an observation I did not fully appreciate in my juvenile intentness on capturing a specimen. I did capture one of the pair, and bore the mark of its teeth on my knee for many days — my desperate grip on its slippery body provided ample provocation for the bite.

From Chastine I brought away an introduction to the rich fauna of southeastern North America that has served me in good stead in my museum career. I should have observed more and collected less; but this lesson I must now transmit to another generation of herpetologists.

At Chastine I came in contact with the alien and bitter and violent and impoverished social climate of the South. I heard a young wife helplessly curse her husband with the wish that the buzzards might pick out his eyes. I saw groves of self-planted pine growing with the cotton rows still plainly to be seen beneath them on cotton land abandoned when its fertility was exhausted by an improvident agriculture, and learned as one of the fundamental differences between the South and the North, that in the South, whether on farm or in village, pigs must be fenced out, whereas in the North we fence pigs in.

I could wish when the Pardee Company wrote off as a total loss the many thousands of dollars that the Chastine wild-catting venture cost them, that they might have entered on the credit side:

"One naturalist, confirmed in his career . . . . . value?"

The Wood Thrush

When lilies by the river fill with sun,
And banks with clematis are overrun;
When winds are weighed with fern-sweet from the hill,
And hawks wheel in the noontide hot and still;
When thistle-tops are silvered every one,
And fly-lamps flicker ere the day is done,
Nature bethinks her how to crown these things,—
At twilight she decides: the wood thrush sings.

John Vance Cheney

Reprinted from *The Audubon Bulletin,* No. 62, June, 1947, page 13.

Time-Lapse Photography

John Nash Ott, Jr.

Twenty years ago when I got my first movie camera, I started taking pictures of just about everything, as I had done previously with my first Brownie box camera. I was particularly interested in taking a moving picture of a plant growing and decided to try my luck at it.

My first subject was some apple blossoms which I had brought into the house for early forcing. I knew it would be necessary to take a picture at regular intervals but had no idea it should be done about every five minutes, as I later found out. I began by taking a picture every hour for the first day and night but by the time the second night rolled around, I thought maybe every two hours would do just as well, and changed my alarm clock accordingly. This work became a little monotonous by the third night and possibly I missed taking one or two of the pictures along toward the early morning hours of the fourth night. When finally completed, the picture turned out far from perfect, in fact the blossoms opened so fast on the screen that it was almost impossible to see the motion at all there was the bud and then all of a sudden it was wide open.

This first experiment was disappointing, of course, but it did prove one thing—namely, that it would be necessary to take individual pictures more frequently and over a much longer period of time if the final results were to show the gradual growth and development of the flowers. It was also obvious that I would have to build an automatic machine to take the pictures for me as it frequently was a little awkward to run home all the time to take another picture. As I recall, it was during history class at school one day that the idea came to me as to how I would build a contraption to operate the camera automatically.

The next morning the eggs were hard-boiled because I had borrowed the works out of the kitchen clock to run the timing mechanism of my new contraption. Soon I had it, a gadget that would work the camera and also turn the lights on and off as well. This made a great improvement in my next attempt in photographing the growth of a plant. It was necessary, however, to place the plants in a rather dark corner of the room as otherwise the added sunlight, in addition to the electric lights, would over-expose the film during the daytime and to varying degrees, depending on the intensity of the sun. Also because sunlight is necessary for the proper growth of the plants, particularly during a long sequence, it was essential to construct a large shutter on the window which would close each time a picture was taken and open immediately afterwards so there would be an even illumination for the picture regardless of day or night and bright days and cloudy days.

Everything seemed to be going along smoothly now and I was grinding out two or three short scenes a year but only on black and white film as that was the only film then available. In 1929 when the first color film came on the market I bought another camera, loaded both with the new film and started in to retake the same pictures. Several years later this first type of color film was so greatly improved that the first was completely outmoded and I seemed to be getting nowhere fast, so I added a third camera and started over again. Meantime ten years had slipped by, but this time was not entirely wasted as I had constantly been working on improvements and refinements for the automatic contraption so that it not only operated the camera, lights, and daylight shutter, but would also water the plants and adjust the camera upward as the plants grew taller.

Now everything seemed ready to go ahead and take pictures of all sorts of plants but this brought up the problem of making the plants bloom the way I wanted them to bloom. Many of them just refused to behave properly. For instance, every picture I tried to take of an orchid was returned by the processor with a new roll of film and a very polite letter explaining that, in spite of all the precautions taken, my film seemed to have been spoiled in development. This soon became rather tiresome and, upon investigation,

the cause of the trouble proved to be that the high humidity necessary to grow orchids would spoil the color film, and if the humidity was lowered to a point where it did not affect the film, the orchids wouldn't grow. Sealing the camera with waterproof tape was not sufficient to keep the moisture out so a way of packing the camera with moisture-absorbing chemicals had to be devised. This was just one of many problems that had to be worked out in trying to combine photography and horticulture.

In observing the growth of plants, I noticed that the flowers and leaves always faced into the light and that the leaves noticeably drooped from lack of water, but would quickly revive when given a drink. I always placed the camera so that the constant daylight came from behind and thus the flowers in facing the daylight would also be facing directly into the camera.

One night I dreamed up a wild idea of controlling the light, temperature and moisture to make the leaves of the plants move in different directions. To accomplish this I constructed special flower pots that would move around on wheels. In each pot was placed a small electric heating element and a water tube. A few more refinements on my timing contraption and everything was all set. The flower pots were pulled around on a track like an old fashioned cable car. The heating elements were turned on at the proper time to wilt the leaves down and the plants were given just the proper amount of water to revive them again. First a battery of lights would go on one side and then the other which would attract the leaves from side to side. Thus I was able to move the plants around a miniature stage and control both the up and down motion and also sideward motion of the leaves. It only remained to synchronize this motion to music. This sequence required five years to complete, including an interruption of two years while I was in the Navy, but it lasts for only two minutes on the screen.

Last summer I made a series of experiments using various weed-killers, and other chemical products now on the market, which clearly show a comparison of the results side by side as the various reactions take place. I intend to devote most of my work in the future toward this particular branch of time-lapse photography, for it seems to me that in it there is a great field for research not only in biology but in medicine and other branches of industry, where the effect or reaction from various treatments is to be studied over a period of time.

Photography still remains a hobby and I have completed a special time-lapse studio where twelve or more cameras may be operated automatically. This studio has incorporated in it all the necessary equipment to control the temperature, humidity and light as well as the various gadgets and contraptions I have developed over the past twenty years to take time-lapse pictures. I believe this experience to be a good beginning, but I have many ideas to work on in the future.

Eugene H. Garnett

Eugene H. Garnett, a veteran of the Chicago Bar and Honorary Trustee of the Academy, died at his home in Evanston on February 7, 1947, after a short illness.

Mr. Garnett was born in Chicago on October 22, 1872. He was the son of Emma Hancock and the Honorable Gwynn Garnett, who was a former judge of the Appellate Court for the First District of Illinois. He was married to Louise A. Garnett, a well known author of songs, poems and oratorios, who preceded him in death.

He was educated in the Chicago schools and graduated from the University of Michigan in 1895 with a Bachelor of Law degree and then studied law in the office of Wilson, Moore and McIlvaine. Admitted to the Illinois

bar in 1897, he became associated with his father in the practice of law under the firm name of Garnett and Garnett in 1899. Cyrus L. Garnett, his brother, became a member of the firm in 1908. His father retired from the practice of law in 1920 and his brother retired from the firm in 1925 to enter the insurance business. From then until 1935 Mr. Garnett practiced alone. In that year the writer became his partner and they continued the practice of law together until his death.

Mr. Garnett was an outstanding Chicago lawyer, noted for his integrity, his knowledge of law, and among lawyers for his unique ability to reduce involved legal documents to simple, clear and understandable language. He was an able trial lawyer, an accomplished brief writer and always held the respect of the bench and the bar. During his 50 years at the Chicago bar he enjoyed an extensive general practice, but in later years confined his work to the representation of corporate clients and to probate and trust matters. He contributed much to the high standards of his profession. For eleven years he was Chairman of the Ethics Committee of the Chicago Bar Association and served on the Ethics Committee of the Illinois Bar Association. For five years he was a member of the Judiciary Committee of the Chicago Bar Association.

Although he was devoted to his profession, he had wide and varied interests. A life long student of English literature, history and art, he had also a sincere interest in science.

He became a Life Member of The Chicago Academy of Sciences February 28, 1911, and a Trustee May 13 of that year. He served as Vice-Chairman of the Board of Trustees from 1940 to 1944, and was made an Honorary Trustee on April 10, 1944. As a Trustee of the Academy he gave considerable time and attention to legal matters concerning the organization and did much to protect and advance its interests.

Mr. Garnett was a gentleman of high ideals, a man of great natural refinement and personal charm. He was always kind and courteous in his dealings with other members of his profession, his associates and his clients, and he was loved and warmly admired by all who knew him.

He was a member of the American, Illinois and Chicago Bar Associations, The Law Club and Phi Delta Phi legal fraternity. He was also a member of Beta Theta Pi fraternity, the Union League Club, Skokie Country Club and Chikaming Country Club. He made his home at 1226 Judson Avenue, Evanston, and since 1932 maintained his office in the One LaSalle Street Building in Chicago.

He is survived by his son, Gordon M. Garnett, his daughter, Gloria Garnett Fogarty, a sister, Mrs. Emeline G. Hardie, and two brothers, Cyrus L. and Robert T. Garnett. —Nat T. Burfeind.

Museum Activities

Annual Meeting

At the 90th Annual Meeting of the Academy, May 12, 1947, the following officers were elected: Dr. Nathan S. Davis, President; Dr. W. F. Henderson, First Vice-President; Dr. Leslie Brainerd Arey, Second Vice-President; Hulburd Johnston, Secretary; Herbert Edwin Bradley and Dr. Louis E. Laflin, Jr., Trustees; and Drs. Orlando Park, Hanford Tiffany, and William E. Powers, Scientific Governors.

The Constitution was amended increasing the number of members of the Board of Trustees from seven to eleven, including the President, First Vice-President, Treasurer of the Academy and the President of the Board of Commissioners of the Chicago Park District as *ex-officio* members.

At the annual meeting of the Board of Trustees, May 27, 1947, Walter A. Grau was re-elected Treasurer.

New Members

The following new members were elected at the 90th Annual Meeting, May 12, 1947:

Contributor: William D. Cox, Chicago.

Life: Herbert Edwin Bradley and Ted Stille, Chicago, and Raymond F. Thomasson, Charleston, West Virginia.

Annual: Joseph G. Fuhry, Chicago.

Associate: Mrs. Ruth Antonucci, William J. Ashe, William Auge, S. H. Bates, Mrs. Louise C. Baumann, Alfred A. Bell, Eric Berglund, Mrs. Reba Hendrickson Coldevin, Norman C. Critchfield, Frank J. Eberhardt, Miss Jenny Erickson, A. Ettlinger, Mrs. D. Gibhardt, Miss Maude Gordon, G. R. Gregory, Neal Taylor Hall, Jerome N. Hamburger, William R. Hanes, S. W. Helferich, Miss Donna Clare Jacobsen, Mrs. Florence McDonald, Mrs. Flora Miller, Miss Flora Moe, A. B. Nelson, Zdzislaw J. Obara, Miss Olga J. Otterblad, Miss Grace E. Peebles, Miss Doris A. Plapp, Bernard Rabin, Mrs. Lalia W. Richards, Joseph S. Rychetnik, Dr. H. Saxon, Morris Saxon, Ernest H. Schaut, R. J. Schobert, Miss Edel Schuffert, Miss Gwendolyn Smith, John L. Switzer, H. S. Thomas, Mrs. J. C. Thompson, Mrs. A. Van Houten, Robert Walker, Everett H. Wallace, Miss Lucile Witter, Harry W. Worcester—all of Chicago; Stanley I. Auerbach, Evanston; George J. Doubek, Berwyn; Edward H. Hanses, Lansing, Michigan; John Bird Lloyd, M. D. and Mrs. J. R. Mannix, Winnetka; Claude Towne, Oak Park.

Change in Auditorium

The seats in the lecture hall have been rearranged, giving a better view of the screen and reducing the interference of the posts which formerly cut off vision from several points in the hall. The screen has been placed at the east end of the hall with seats arranged in rows parallel to it. Side sections are at an angle, affording better observation for all.

Special Lectures

Two special evening lectures were held at the Academy this spring. The first, presented through the coöperation of Trans World Airlines April 22, was a color motion picture, "The Charm of Ireland," with a lecture by the noted author and photographer, Dr. John Harvey Furbay.

The second lecture, on May 29, was "Flowers in Action" by John Nash Ott, Jr., an Honorary Trustee of the Academy. This program, which was given last fall on the regular Sunday Afternoon series, was repeated by popular request. Mr. Ott has worked with time-lapse photography of growing plants for over twenty years and this unusual picture is tangible evidence of the success of his work. *(See page 21.)*

Children's Programs

The annual series of Saturday Morning Programs for Young People included eight sound motion pictures this year starting on April 5 and continuing through May 24. Over 1800 children attended.

The titles for the entire series follow:

April 5. "Swiss Family Robinson."
April 12. "A Trip to Australia."
April 19. "Wings Over Latin America."
April 26. "A Trip to India."
May 3. "El Navajo."
May 10. "A Trip to Sweden."
May 17. "Jacaré."
May 24. "A Trip to South Africa."

Lobby Exhibit

An exhibit of water color paintings of animals and plants of the Solomon Islands by William J. Beecher, Chicago artist and naturalist, is currently on display in the lobby of the Academy. These paintings of the flora and fauna of the Solomon Islands were made during the war to help the artist's comrades identify the strange animals and plants which they found about their camp. Mr. Beecher's work shows an excellent cross section of the natural history of the Solomon Islands.

Bird-banding Conference

The Seventh Annual Chicagoland Bird-banding Conference, sponsored by the Wm. I. Lyon Bird-banding Council and the Academy was held Saturday, March 22, in the Academy auditorium. There were two sessions of the conference, one at 2:00 P.M. and the other at 8:00 P.M.

During the afternoon, bird-banders from the middle west presented short papers on their findings. The evening meeting was devoted to a lecture by Wesley F. Kubichek of the U. S. Fish and Wildlife Service entitled "The Bear River Wildlife Refuge," illustrated with kodachrome motion pictures.

New Publications

Three issues of *Natural History Miscellanea* have recently been published: Number 6, "Color Abnormalities in *Pseudemys scripta troostii* (Holbrook)," by Fred R. Cagle, 3 pages, 1 figure, June 2; Number 7, "The *Gyrinophilus* Salamanders of Mt. Mitchell, North Carolina," by Nelson G. Hairston, 3 pages, 1 figure, June 28; and Number 8, "Occurrence of a Caudivagant Mechanism in Salamanders," by Hobart M. Smith, 2 pages, June 30.

Scientific publications of the Academy are available to active members upon request; others may purchase those listed above at five cents each.

Information Booklet and Post Card Folder

A sixteen-page booklet describing the Academy has recently been published. Illustrations depict the many activities of the Academy and interpret its position in the cultural and scientific life of the community.

Many requests from visitors for pictures of the museum exhibits prompted the preparation of a post card folder with pictures of eight of the habitat groups in the Chicago Environs Hall. The folder sells for ten cents.

Lewis C. Walker, 1875-1947

As this issue of *The Chicago Naturalist* went to press, news was received of the death of Lewis Carter Walker on June 11 at his home in Evanston. Mr. Walker, president of the Aermotor Company and a life member of the Academy, was a Trustee from 1919 until the time of his death and Chairman of the Board from 1925 to 1941.* It is hoped that a biographical sketch may be available for publication in a later issue.

*See "Lewis C. Walker—An Appreciation," by Henry S. Henschen, Chicago Nat., vol. 4, 1941, no. 2, p. 53.

Field Work

Dr. H. K. Gloyd, Director of the Museum, left on June 30 for the Southwest to continue herpetological studies in Arizona. He is accompanied by Dr. William M. Clay, Assistant Professor of Biology of the University of Louisville. They plan to collect specimens of amphibians and reptiles and make motion pictures in the Huachuca Mountains and vicinity and in the Papago Country between Tucson and Yuma. The Southwestern Arboretum near Superior will be visited again with the object of completing some of the work initiated there during previous years.

Since 1940, when members of the Academy staff first made field headquarters at the Arboretum, considerable attention has been given to the herpetofauna of that area. The desert north of the town of Florence has yielded a large number of specimens of small, nocturnal snakes which were collected at night, either by searching the desert floor with powerful flashlights or by watching for them on the highway in the light from an automobile.

Motion pictures made in this region during recent years have been edited as a 40-minute film entitled "The Sonoran Desert." The new film has been recently shown by Dr. Gloyd at the Union League Club and the Adventurers Club of Chicago, the Orrington School, Evanston, and the Illinois Junior Academy of Science at Peoria.

State Science Talent Search

During the past year The Chicago Academy of Sciences coöperated with the Illinois Academy of Science in a project to extend the Westinghouse Science Talent Search in a State Science Talent Search for Illinois. The Westinghouse Talent Search is conducted each year on a nation-wide basis by Science Clubs of America. More than 16,000 high school seniors entered the contest this year and forty winners were chosen on the basis of a three hour science aptitude examination, personal recommendation from teachers, scholastic record, and a 1,000 word essay on "My Scientific Project." The judges were nationally known men in science: Dr. Harlow Shapley, Director of Harvard College Observatory; Dr. Harold A. Edgerton, Professor of Psychology, Ohio State University; Dr. Steuart Henderson Britt, psychologist, New York City; and Dr. Rex Buxton, Washington psychiatrist.

Illinois had four winners and 13 "honorable mentions" in the national contest. Of the remaining large group of entrants there are many outstanding students. It was from this group that the winners of scholarships in the State Science Talent Search were chosen. The qualifications of the entrants from Illinois were considered by a judging committee headed by Professor L.J. Thomas, Department of Zoölogy, University of Illinois. Dr. Eliot C. Williams, Jr., Assistant Director of the Academy was chairman of the committee which procured the scholarships from colleges and universities throughout the state.

The results of the first State Talent Search were very gratifying. Over twenty scholarships of either full or half tuition were obtained from colleges and universities in Illinois.

Waterfowl Conference

A special conference on the critical situation regarding waterfowl in the United States and Canada was held at the Academy, April 29 and 30, under the auspices of the Fish and Wildlife Service, U. S. Department of the Interior. The first day's sessions were for game specialists and technicians from the middle western states but during the second day meetings were open to the public. Attendance was between 50 and 60.

The Naturalist's Book Shelf

The Mosquitoes of the Southern United States East of Oklahoma and Texas.

By Stanley J. Carpenter, Woodrow W. Middlekauff, and Roy W. Chamberlain.

American Midland Naturalist, Monograph No. 3. The University Press, Notre Dame, Indiana. 292 pages, 155 figures. $4.00 postpaid.

It is a source of considerable satisfaction to have this work at hand, since it is, in a sense, the culmination of the combined efforts of the considerable number of entomologists who served in the malaria survey and control program of the Fourth Service Command during World War II. The program was by far the most comprehensive and the best conceived and executed of the army malaria program in the United States.

The extensive mosquito survey collections made by post entomologists at the numerous camps throughout the Southeast largely formed the basis of the studies which resulted in the monograph under discussion. In the reviewer's opinion it is the most satisfactory treatment of the mosquitoes of a large region of the United States that has yet been published.

This monograph is not a handbook of general information on the mosquitoes, but is rather a guide to the identification of the species for the technician and the specialist. The introductory pages contain much useful information on the techniques of collecting, rearing, preserving, and identifying mosquitoes and a summary of their medical importance. The greater part of the work consists of descriptions of the species, keys to the larvae and adults, illustrations of the most important identification characters of each species, short notes on species bionomics, and a bibliography of the more important papers that deal with the mosquito fauna of the southern states. The clean, accurate illustrations prepared by Elizabeth Kaston deserve particular mention. The format and typography are excellent.

At least one reviewer of this book has remarked on the fact that the pupal characters of each species were not studied and described. Such studies would have necessitated the rearing of all the species by the entomologists stationed throughout the command. The difficulties that would have been involved in accomplishing this can only be appreciated by those who served as post entomologists in the army. Despite excellent planning and support by the higher levels of command, the entomologists too often encountered considerable resistance or lack of understanding on the part of the Post Surgeon* (whose command they were under) or members of his staff. The attitude of some of these men may be epitomized in the words of the Malariologist (M.C.) of the South Atlantic Theater (Brazil). This officer was in charge of the activities of the Malaria Survey Unit which the reviewer commanded. His words may be paraphrased thus: "I don't want you to do any mosquito or parasite surveys. You are not here to establish an insect museum. All I want from you at any given time is an estimate of the malaria potential." (!)

In view of such prevalent attitudes on the part of men *considered* to be qualified to supervise the field activities of the various Sanitary Corps specialists, a great deal of credit is due Col. Loren D. Moore, M. C. (Commanding Officer, 4th Sv. C. Med. Lab.), and Brig. Gen. James S. Simmons, M.C. and Col. Wm. A. Hardenbergh, Sn.C. (Div. of Preventive Medicine, Office of the Surgeon General) for actively encouraging and aiding the publication of this monograph.

Much work yet remains to be done on the mosquitoes of the southern states, even

*However, in all fairness, credit must be given to the many Surgeons, both in the U. S. and abroad, who actively supported the many aspects of the malaria survey control programs.

though the fauna is now the best known in the country. However, a very valuable and definitive study on the taxonomy of the species now exists; it has been repeatedly demonstrated that such taxonomic work is essential to the elucidation of the biology of the mosquitoes. A knowledge of the biology of the species and races is, in turn, indispensable to the control of mosquito-borne diseases.

Rupert L. Wenzel.

A Key to Precious Stones

By L. J. Spencer

Emerson Books, Inc., New York, 1946, vii, 237 pages, 8 halftones, index. Cloth, $3.25.

This is a recent revision of a book which has become one of the standard works on gem minerals. Dr. Spencer is a mineralogist, who has specialized in gem minerals and is one of the world's outstanding authorities on the science of gems. His book is a textbook and standard work for dealers and professional gem experts on both sides of the Atlantic. It covers the subject thoroughly yet is within the scope of the non-technical reader.

The first portion of the book is devoted to the general principles of gem mineralogy. The author explains the physical and chemical properties of gems; their crystallography and optical phenomena and takes up briefly the geology of their origin and occurrence.

The second part of the book discusses the various gem mineral species individually and in detail. A chapter is devoted to each of the most important species. Spencer gives a brief summary of the characteristics of each species at the end of these chapters. He calls these "keys to the character of gemstones" and takes the book title from this practice.

This is essential reading for anyone seeking a thorough understanding of gem minerals, but is not the literary concomitant of a hammock and a warm summer afternoon.

Jack H. Lund.

The Story of the Gems

By Herbert P. Whitlock

Emerson Books, Inc., New York, 1945, ix, 206 pages, 2 color plates, many halftones, bibliography, index. Cloth, $4.00.

"The Story of the Gems" fits the popular concept of "cultural" reading. Were it condensed it would do well as a "paper" to be read before the Suburban Heights Woman's Club.

It covers the subject in a general way and supplies plenty of those extravagant adjectives and romantic allusions, which the ladies hold dear. It skirts carefully along the edge of explaining the optical phenomena of gemstones, and makes few demands on the reader's powers of concentration.

Mr. Whitlock undertakes some further juggling of gems from the "semi-precious" to the "precious" classification. Most modern mineralogists and gemologists regard these classifications as artificial and fallacious though the lay public still uses them. Apparently Whitlock prefers not to disturb his reader's preconceived though fallacious concepts of the subject.

The book is easy reading, if a casual or elementary knowledge of gem-minerals is sought.

Jack H. Lund

Field Book of Eastern Birds

By Leon Augustus Hausman

G. P. Putnam's Sons, New York, 1946, xvi, 659 pages, over 400 illustrations, 6 colored plates, bibliography, index. Cloth, $3.75.

A field key to bird families, with a drawing, in each case, of a species exemplar, is based on size, pattern, flight, habitat and the like. Thence the reader is referred to the page on which occurs a field key to the species. In this a general description of the bird is given, accompanied by the several local names, field marks, characteristics, habits, notes and range.

There is, also, for the use of the beginner, a key to the birds commonly seen about the home. Size, compared with robin or sparrow, and obvious characters give the novice his clue.

Dr. Hausman makes generous acknowledgement to various well-known sources and to his students for much of the material. That he has made excellent choice of it is apparent to one familiar with popular ornithological literature.

The book offers a new and simple plan for the identification of birds and, no doubt, will find much favor in the view of those who would add to their outdoor pleasures an acquaintance with their feathered neighbors.

The figure of the worm-eating warbler to illustrate the vireo family is a mistake of the sort which will escape the most careful preparation and editing.

E. R. Ford.

Scientific Instruments

Edited by Herbert J. Cooper

Chemical Publishing Company, Brooklyn, New York, 1946, 305 pages, many drawings and photographs, index. Cloth, $6.00.

A useful reference work, prepared by a group of specialists, for the professional scientist and the serious-minded amateur. For the most part, the instruments described are those used in making various types of physical measurements. Sections of the book deal with Optical Instruments; Measuring Instruments, including temperature, time, speed, weight, and other factors; Navigational and Surveying Instruments; Liquid Testing; and a Miscellaneous section on Acoustics, Calculating Machines, Hardness Indicators, and Vacuum Tubes.

Throughout the book there are many line drawings and photographs which show the basic mechanisms of the instruments described.

COVER DESIGN, by Fred H. Yaeger, Jr. The ocelot or tiger cat, *Felis pardalis*, inhabiting tropical America and ranging north to Texas, reaches a length of four feet and a weight of 20-35 pounds.

Reptiles and Amphibians of the Northeastern States

By Roger Conant

Zoölogical Society of Philadelphia, 34th St. and Girard Ave., 40 pages, 1 map, many illustrations, index. Paper, $1.00.

This handsomely illustrated booklet is essentially a reprint of a series of non-technical articles on the herpetofauna of the New England states, Delaware, New Jersey, and the eastern portions of Pennsylvania and New York, which appeared separately in *Fauna*, the popular magazine of the Zoölogical Society of Philadelphia. It contains a check list of species with their known geographic ranges, followed by sections treating the snakes, lizards, turtles, frogs and toads, and salamanders, respectively, under the headings Spare that Snake, Greased Lightning, The Timeless Turtle, Voices of Spring, and Sprites of Rill and Woodland. The different species are illustrated by excellent halftones in double-page "spreads" accompanied by text giving descriptive information for each in condensed form. There is a section on first aid for snake bite, another on care of captive specimens, and a list of books and papers especially useful for further study.

The author is Curator of the Philadelphia Zoölogical Garden and one of the foremost students of the herpetology of eastern North America. His authoritative knowledge of these animals, his understanding of what beginners want to know and ought to know, and his ability to write simply and succinctly combine to make this attractive brochure not only a source of reliable information but pleasant reading besides. Its larger than usual size (9 x 11½ inches), while advantageous for the layout of the illustrations, is inconvenient for storage on the average bookshelf. Librarians will probably need duplicate copies for it is the kind of thing that is frequently purloined.

H. K. Gloyd.

Book Notices

A Laboratory and Field Manual of Ornithology

By Olin Sewall Pettingill, Jr.

Burgess Publishing Company, Minneapolis, Minn., 1946, v, 248 pages, bibliography, illustrated. Paper, $3.50.

A Tippy Canoe and Canada Too

By Sam Campbell

Bobbs-Merrill Company, Indianapolis, Ind., 1946, 250 pages, many line drawings. Cloth, $2.00.

Meriwether Lewis: Boy Explorer

By Charlotta M. Bebenroth

Bobbs-Merrill Company, Indianapolis, Ind., 1946, 182 pages. Cloth, $1.50.

The Weather

By George Kimble and Raymond Bush

Penguin Books, Inc., New York, N. Y., 1946, 185 pages, illus., bibliography, index. Paper, $0.25.

The Birth and Death of the Sun

By George Gamow

Penguin Books, Inc., New York, N. Y., 1945, xix, 219 pages, illus., index. Paper, $0.25.

Panamic Marine Shells

By Maxwell Smith

Tropical Photographic Laboratory, Winter Park, Florida, 1944, xiii, 127 pages, 912 figures, index, Cloth, $6.00.

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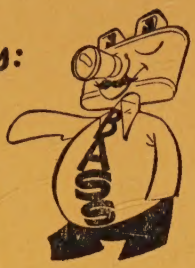

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